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Working Paper Number	1984-028A
Creation Date	January 1984
Citable Link	https://doi.org/10.20955/wp.1984.028
Suggested Citation	Batten, D.S., Belongia, M.T., 1984; Monetary Indicators of Economic Activity: A Comment, Federal Reserve Bank of St. Louis Working Paper 1984-028. URL https://doi.org/10.20955/wp.1984.028

MONETARY INDICATORS OF ECONOMIC ACTIVITY: A COMMENT

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84-028

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I. INTRODUCTION

A recent article by Silvia (1984) addresses the question concerning which macroeconomic variable is the best indicator of the influence of monetary actions on economic activity. He investigates this issue within the framework of the St. Louis equation (Andersen and Jordan (1968)) because it relates fiscal and monetary actions to economic activity (as measured by nominal GNP growth).[1/]

The unusual nature of Silvia's results, however, raises serious questions about his empirical analysis. In particular, Silvia's estimated equation is substantially different from any reported in the voluminous literature concerning the St. Louis equation, even though the specification is essentially identical. Furthermore, by simply comparing summary statistics, Silvia concludes that there is no basis for distinguishing among various potential indicators of monetary actions. Our purpose here is to re-examine the comparison of monetary indicators and, in doing so, demonstrate that the estimated equation upon which Silvia's conclusions are based cannot be duplicated using published data. Moreover, we also demonstrate that, for the variables considered by Silvia, M1 is the most appropriate indicator of monetary actions.

II. ESTIMATION OF THE ST. LOUIS EQUATION

The specification employed by Silvia is the following:

$$\dot{Y}_t = a + \sum_{i=0}^{p} m_i \dot{M}_{t-i} + \sum_{j=0}^{q} e_j \dot{E}_{t-j} + w\, S_t + u_t \qquad (1)$$

where $\dot{Y}$ = the growth rate of nominal income, $\dot{M}$ = the growth rate of a monetary variable, $\dot{E}$ = the growth rate of high-employment federal expenditures, S = the man-days idle due to strikes, and u is a random error term.[2/] The monetary indicators that he investigated are M1, M2, M3, the monetary base (MB), nonfinancial domestic credit (CREDIT), Moody's Aa utility rate (RAa) and the federal funds rate (FFR).[3/] To evaluate the explanatory power of each of these potential monetary indicators, equation (1) is estimated using each of these variables as M. In each estimation, Silvia constrained p and q to equal 4, imposed a second degree polynomial on each distributed lag, and corrected for second order autocorrelation.[4/]

It should be noted first that Silvia's results differ in a number of respects from those of previous published studies. Using these studies as precedent, the St. Louis equation typically explains about 40-50 percent of the variation in nominal income growth. In contrast, Silvia's estimates of $\bar{R}^2$ are usually greater than 0.80.[5/] Moreover, he reports the need for a second order autocorrelation correction although most researchers have estimated the model's Durbin-Watson statistic to be near 2.0.

The results of our estimation of equation (1) with published data using the monetary indicators included in Silvia are reported in table 1.[6/] Like those of preceding studies, our results are quite different from Silvia's.[7/] In particular, using exactly the same sample period (I/1961-IV/1978) and specification, and imposing the same polynomial restrictions as does Silvia, our $\bar{R}^2$s are, at best, about half as large as his. The Durbin-Watson statistics also do not indicate the presence of any autocorrelation. Furthermore, when we estimated equation (1) with any of the monetary indicators and corrected for second-order autocorrelation (as Silvia does), neither of the estimated autocorrelation coefficients was statistically significant at the 5 percent level.

Our results offer economic interpretations that also differ sharply from Silvia's. For example, the sum of the coefficients of the growth of high-employment government expenditures is significant at the 5 percent level only in the equation using the Aa utility rate as the monetary indicator. Silvia reports that this sum is significant in 4 of his 7 estimated equations. Our in-sample fit of equation (1) also varies substantially across the different monetary indicators. In contrast to the nearly equal performances of the monetary indicators that Silvia reports, the results in table 1 suggest that the specification with either M1 or CREDIT fits the data much better than do the specifications using the other indicators.

III. CHOOSING AMONG THE MONETARY AGGREGATES

Silvia states that "no one measure (monetary indicator) exhibits clearly superior in-sample performance" and, consequently, concludes that no one indicator should be preferred over the others. This observation and conclusion, however, are based on a superficial comparison of the summary statistics from the estimations of equation (1) using the various monetary indicators. For a monetary indicator to be an appropriate intermediate target, there must be a predictable relationship between it and economic activity (in this case, as measured by the growth of nominal GNP). How good this relationship is can be tested using statistical tools.

Since M1 is contained in both M2 and M3, the argument that either of the broader aggregates is preferred to (or is as good as) M1 can be tested easily. In particular, this assertion can be examined by testing whether the non-M1 components of M2 or M3 provide additional explanatory power over that of M1 alone in the estimation of equation (1). Following the approach of Batten and Thornton (1983b), we estimated equation (1) with M1 and the non-M1 components of M2 included separately and then performed the same experiment with M3. Table 2 presents the results of these two experiments (along with the estimation results of (1) with M1 alone to provide a frame of reference). The conclusions are unambiguous: The explanatory power of either M2 or M3 comes entirely from either M1 component; the non-M1 components of either M2 or M3 (NM) add nothing to the explanatory power of the equation.[8/] Consequently, it is clear that M1 is preferable to M2 or M3 as a monetary indicator.

Since the specifications with M1, FFR, RAa and CREDIT are not nested within each other, the comparison of these indicators must be conducted using a method for testing non-nested hypotheses such as the J-test developed by Davidson and MacKinnon (1981). This procedure simply establishes one specification as the null hypothesis and tests (using a conventional t-test) whether an alternative specification adds to the explanatory of the specification under the null hypothesis. If the calculated t-statistic is not statistically significant, then the alternative specification does not add to the explanatory power of the null specification. On the other hand, if the calculated t-statistic is statistically significant, then the null is rejected in favor of the alternative specification.

The t-statistics for the pairwise comparisons of FFR, RAa and CREDIT with M1 are presented in table 3. For comparisons using RAa and CREDIT, the conclusions are unambiguous: the data clearly reject either RAa or CREDIT as the monetary indicator in favor of M1. The J-test results for the comparison of M1 and FFR, however, do not provide an unambiguous basis for distinguishing between these two monetary indicators. Despite this mixed result, the results in table 1 may indicate that M1 is preferred to FFR. In particular, in the estimation of equation (1) with FFR, the sum of its coefficients is not statistically significant at the 5 percent level while the sum of the coefficients of M1 is. Furthermore, the explanatory power of the M1 equation is more than 2.5 times greater than the FFR equation.

IV. CONCLUSIONS

Silvia's recent investigation of the link between various monetary indicators and economic activity is unique relative to a substantial body of previously published work. The differences are reflected primarily by his specification's extraordinarily high explanatory power and its apparent refutation of results consistently reported in the literature.

Because we were unable to obtain the exact data set used by Silvia, duplication of his results was not possible. Using available, published data for the sample period he studies and the specification he reports, we find that many of the conclusions that he draws cannot be supported. Moreover, we have demonstrated that, using standard statistical methods, choices <u>can</u> be made among the monetary indicators that he analyzes, and that M1 appears to be the most appropriate one.

FOOTNOTES

1/ Using the St. Louis equation to test the relative efficacy of monetary and fiscal actions has been criticized on several grounds. See Batten and Thornton (1983a) and the references cited there. We follow this approach because it was the one chosen by Silvia.

2/ Silvia states that B. Friedman (1977) was the first to suggest using high-employment government expenditures as an indicator of fiscal actions. This is incorrect: Andersen and Jordan (1968) originally advocated the use of this series.

3/ It is not clear how Silvia specified the interest rate variables. We report first differences. We also estimated (1) using the levels of FFR and RAa. These results, however, were unsatisfactory as the sum of the coefficients of each interest rate variable was positive.

4/ Silvia makes a point to note that he does not impose "endpoint constraints" on the distributed lags in (1), because these constraints may not be supported by the data and, hence, bias the parameter estimates. More important, however, is the fact that, since they do not constrain the endpoints, there is no theoretical justification for their use. (See Thornton and Batten 1984).

The imposition of polynomial restrictions, if they are not supported by the data, also will bias the parameter estimates. These restrictions are testable. For all of the specifications of (1) reported here, the polynomial restrictions cannot be rejected.

5/For a sample of estimates typically produced by the St. Louis equation, see Batten and Thornton (1984, 1983), Tatom (1981), and Hamburger (1977).

6/Following Silvia, we do not report the estimated coefficient for the strike variable (S) in equation (1). These estimates were always negative but statistically significant in only about one-half of the specifications.

7/Because our results are so different from Silvia's, we contacted him to check our interpretation of his specification and his data. He confirmed that our specification of equation (1) is the same as his and claimed to have used the same published data that we used. Since he claimed that he could not provide us with his data set, however, the differences between his results and ours remain a mystery.

8/The F-statistic for testing the hypothesis that all of the coefficients of the non-M1 components of M2 are jointly zero is 0.27, well below the 5 percent critical value of 2.76. Likewise, the F-statistic for the same test of the non-M1 components of M3 is 0.23.

Table 1

St. Louis Equation Estimated with Various Monetary Indicators: I/1961-IV/1978

Monetary Indicators	ΣM	ΣG	SE	$\bar{R}^2$	DW
M1	1.194 (5.63)*	0.102 (1.08)	3.18	0.38	2.21
M2	0.672 (3.89)*	0.186 (1.74)	3.61	0.20	1.83
M3	0.583 (3.68)*	0.169 (1.57)	3.64	0.19	1.80
FFR	-0.138 (0.15)	0.216 (1.93)	3.75	0.14	1.63
RAa	-7.429 (2.02)*	0.269 (2.25)*	3.92	0.06	1.65
CREDIT	0.959 (4.81)*	0.076 (0.77)	3.30	0.36	2.16
MB	1.159 (4.99)*	0.022 (0.21)	3.43	0.28	1.94

Absolute values of t-statistics in parentheses.
*Statistically significant at the 5 percent level.

Table 2

Comparison of M1, M2 and M3

Monetary Variables	$\Sigma M1$	ΣNM	ΣG	SE	$\bar{R}^2$	DW
M1	1.194 (5.63)*	--	0.102 (1.08)	3.18	0.38	2.21
M1 M2-M1	1.202 (4.70)*	0.060 (0.42)	0.103 (1.06)	3.23	0.36	2.23
M1 M3-M1	1.272 (4.91)*	-0.008 (0.06)	0.094 (0.96)	3.24	0.36	2.24

NOTE: NM is the annual growth rate of (M2-M1) in the second equation and the annual growth rate of (M3-M1) in the third.

Absolute values of t-statistics in parentheses.
*Statistically significant at the 5 percent level.

Table 3

Comparison of M1, FFR, RAa, CREDIT: J-tests

Monetary Indicator Under Null/Alternative Hypotheses	t-statistic
M1/FFR	2.38*
FFR/M1	5.69*
M1/RAa	0.14
RAa/M1	5.77*
M1/CREDIT	1.87
CREDIT/M1	2.91*

*Statistically significant at the 5 percent level.

REFERENCES

Andersen, L. C., and J. L. Jordan. "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," Federal Reserve Bank of St. Louis _Review_, 50 (November 1968), pp. 11-24.

Batten, D. S., and D. L. Thornton. "How Robust Are the Policy Conclusions of the St. Louis Equation?: Some Further Results," Federal Reserve Bank of St. Louis _Review_, 66 (June/July 1984), pp. 26-32.

______. "Polynomial Distributed Lags and the Estimation of the St. Louis Equation," Federal Reserve Bank of St. Louis _Review_, 65 (April 1983a), pp. 13-25.

______. "M1 or M2: Which Is the Better Monetary Target?" Federal Reserve Bank of St. Louis _Review_, 65 (June/July 1983b), pp. 36-42.

Davidson, R., and J. G. MacKinnon. "Several Tests for Model Specification in the Presence of Alternative Hypotheses," _Econometrica_, 49 (May 1981), pp. 781-93.

Friedman, B. "Even the St. Louis Model Now Believes in Fiscal Policy," _Journal of Money, Credit, and Banking_, 9 (May 1977), pp. 365-67.

Hamburger, M. J. "Behavior of the Money Stock, Is There a Puzzle?" _Journal of Monetary Economics_, 3 (July 1977), pp. 265-88.

Silvia, J. E. "Monetary Indicators of Economic Activity," _Eastern Economic Journal_, 10 (January-March 1984), pp. 15-22.

Tatom, J. A. "Energy Prices and Short-Run Economic Performance," Federal Reserve Bank of St. Louis Review, 61 (January 1981), pp. 3-17.

Thornton, D. L., and D. S. Batten. "What Do Almon's Endpoint Constraints Constrain?" Federal Reserve Bank of St. Louis Research Paper No. 84-017 (1984).